

Subject: MS Colloquium, 5/4, 11am, Bldg. 200, Auditorium
From: Janice Coble <coble@anl.gov>
Date: Fri, 21 Apr 2006 07:44:37 -0500
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MATERIALS SCIENCE DIVISION COLLOQUIUM

SPEAKER: DAVID REIS
University of Michigan
and
Stanford Linear Accelerator Center

TITLE: Femtosecond X-Ray Measurements of Coherent Atomic Motion

DATE: Thursday, May 4, 2006

TIME: 11:00 a.m.

PLACE: Building 200, AUDITORIUM

HOST: Paul Fuoss

Refreshments will be served at 10:45 a.m.

Abstract — Using x-rays from the Subpicosecond Pulse Source at the Stanford Linear Accelerator Center, we are able for the first time to map the details of the non-equilibrium interatomic potential surface of a highly-excited solid with femtosecond resolution. These are also the first experiments to utilize the unavoidable temporal jitter of an accelerator-based source as a means of random sampling of the delay between the laser pump and the x-ray probe. We find that in bismuth photo-excitation drives the system away from a Peierls distorted structure towards a higher symmetry state, accompanied by significant softening of the potential. High amplitude coherent atomic motion is excited as the interatomic forces are altered impulsively by the rapid excitation of free-carriers. The results shed light on the relative role that anharmonicity and electronic softening play in the phonon dynamics. They are in excellent agreement with constrained density functional calculations (DFT), a validation of the general approach of DFT to predict excited state properties of materials.